

Atty. Docket No. CPAC 1029-5
Appl. No. 10/681,583

PATENT

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (original) A multi-package module comprising stacked first and second packages, each said package including a die attached to a substrate, wherein the second package is inverted, wherein the first and second substrates are interconnected by wire bonding, and wherein the first package comprises a flip-chip ball grid array package having a flip-chip in a die-up configuration.
2. (original) The multi-package module of claim 1 wherein the inverted second package is a wire bonded land grid array package.
3. (original) The multi-package module of claim 2 wherein the die and wire bonds in the inverted second package are at least partially encapsulated with a molding material.
4. (original) The multi-package module of claim 2 wherein the die and wire bonds in the inverted second package are fully encapsulated with a molding material.
5. (original) The multi-package module of claim 2 wherein the second package substrate is a single-metal layer substrate.
6. (original) The multi-package module of claim 2 wherein the second package substrate is a bump chip carrier type package substrate.
7. (original) The multi-package module of claim 1 wherein the flip chip package is provided with an electrical shield.
8. (original) The multi-package module of claim 7 wherein the electrical shield is configured to serve as a heat spreader.

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9. (original) The multi-package module of claim 1 wherein the flip chip package includes an RF die.
10. (original) The multi-package module of claim 7 wherein the flip chip package includes an RF die, and the shield serves to limit electromagnetic interference between the RF die and other die in the multi-package module.
11. (original) The multi-package module of claim 1 wherein the first package is provided with an electrical shield.
12. (original) The multi-package module of claim 1 wherein the inverted second package is a stacked die package.
13. (original) The multi-package module of claim 12 wherein adjacent stacked die in the stacked die package are separated by spacers.
14. (original) The multi-package module of claim 1 wherein the second package is stacked over the first package, and wherein the flip-chip die on the first package is provided with an electrical shield.
15. (original) The multi-package module of claim 1 wherein the first package substrate includes an embedded ground plane.
16. (original) The multi-package module of claim 15, the ground plane being configured to serve for heat dissipation.
17. (original) The multi-package module of claim 15, the ground plane being configured to serve as an electrical shield.

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18. (original) The multi-package module of claim 1 wherein at least one of the first and the inverted second package is a stacked-die package.
19. (original) The multi-package module of claim 1 wherein the inverted second package is a stacked-die package.
20. (original) The multi-package module of claim 1, further comprising a heat shield.
21. (original) A method for making a multi-package module, comprising providing a die-up flip chip first package including a first package substrate, providing a second package including a die and a second package substrate, inverting the second package and stacking the inverted second package over the first package, and electrically interconnecting the first and second packages by wire bonds connecting the first package substrate and the second package substrate.
22. (original) The method of claim 21 wherein providing a die-up flip chip first package comprises providing an unsingulated strip of die-up flip chip first packages.
23. (original) The method of claim 21 wherein providing a die-up flip chip first package comprises testing die-up flip chip packages for a performance and reliability requirement, and selecting a package meeting the said requirement as a said first package.
24. (original) The method of claim 21 wherein providing a second package comprises testing packages for a performance and reliability requirement, and selecting a package meeting the said requirement as a said second package.
25. (original) The method of claim 21 wherein providing a second package comprises providing a land grid array package.

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26. (original) The method of claim 21 wherein providing a second package comprises providing a bump chip carrier package.
27. (original) The method of claim 21 wherein stacking the second package over the first package comprises affixing the inverted second package onto a surface of the first package substrate.
28. (original) The method of claim 27 wherein affixing the second package onto a surface of the first package substrate comprises applying an adhesive onto a die attach area of the first package surface substrate and contacting the inverted second package with the adhesive.
29. (original) The method of claim 28 wherein applying the adhesive comprises applying a curable adhesive, and further comprising curing the adhesive.
30. (original) The method of claim 21, further comprising attaching second-level interconnect balls onto the first substrate.
31. (original) The method of claim 21, further comprising encapsulating features over the first substrate with a molding compound.
32. (original) The method of claim 22, further comprising singulating the completed module from the strip.
33. (original) The method of claim 23, further comprising providing the first package with an electromagnetic shield.
34. (original) The method of claim 21, further comprising providing the module with a heat spreader.

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35. (original) The method of claim 34 wherein providing the module with a heat spreader comprises performing a drop-in molding operation.
36. (original) The method of claim 34 wherein providing the module with a heat spreader comprises affixing a generally planar heat spreader onto an upward facing surface of the inverted second package.
37. (original) A mobile communications device comprising a multi-package module according to claim 1.
38. (original) A computer comprising a multi-package module according to claim 1.